

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

PCT

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY (PCT Rule 43bis.1)

To:

see form PCT/ISA/220

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference see form PCT/ISA/220		FOR FURTHER ACTION See paragraph 2 below
International application No. PCT/JP2004/006679	International filing date (day/month/year) 12.05.2004	Priority date (day/month/year) 15.05.2003
International Patent Classification (IPC) or both national classification and IPC H10M8/04, H01M8/24, H01M8/10		
Applicant NISSAN MOTOR CO., LTD.		

1. This opinion contains indications relating to the following items:

- ☒ Box No I Basis of the opinion
- ☒ Box No II Priority
- ☐ Box No III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No IV Lack of unity of invention
- ☒ Box No V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No VI Certain documents cited
- ☐ Box No VII Certain defects in the international application
- ☐ Box No VIII Certain observations on the international application



2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA"). However, this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of three months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

<p>Name and mailing address of the ISA:</p>  <p>European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465</p>	<p>Authorized Officer</p> <p>Stellmach, J</p> <p>Telephone No. +49 89 2399-8279</p> 
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**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/JP2004/006679

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.
☐ This opinion has been established on the basis of a translation from the original language into the following language , which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
 - a. type of material:
 - ☐ a sequence listing
 - ☐ table(s) related to the sequence listing
 - b. format of material:
 - ☐ in written format
 - ☐ in computer readable form
 - c. time of filing/furnishing:
 - ☐ contained in the international application as filed.
 - ☐ filed together with the international application in computer readable form.
 - ☐ furnished subsequently to this Authority for the purposes of search.
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/JP2004/006679

Box No. II Priority

1. ☒ The following document has not been furnished:

☒ copy of the earlier application whose priority has been claimed (Rule 43*bis*.1 and 66.7(a)).

☐ translation of the earlier application whose priority has been claimed (Rule 43*bis*.1 and 66.7(b)).

Consequently it has not been possible to consider the validity of the priority claim. This opinion has nevertheless been established on the assumption that the relevant date is the claimed priority date.

2. ☐ This opinion has been established as if no priority had been claimed due to the fact that the priority claim has been found invalid (Rules 43*bis*.1 and 64.1). Thus for the purposes of this opinion, the international filing date indicated above is considered to be the relevant date.

3. Additional observations, if necessary:

Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1-33
	No: Claims	
Inventive step (IS)	Yes: Claims	
	No: Claims	1-33
Industrial applicability (IA)	Yes: Claims	1-33
	No: Claims	

2. Citations and explanations

see separate sheet

Re Item V.

SECTION V -----

1. Prior art

Documents (1) - (7) which were cited in the **International Search Report** are considered to represent relevant prior art in this **Written Opinion**; the numbering will be adhered to in the rest of the procedure.

- (1) JP-A-2002,208,421
- (2) EP-A-0 716 463
- (3) WO-A-99/28 985
- (4) US-2003082433
- (5) US-A-6 322 918
- (6) J.Power Sources **49**, 117 (1994)
- (7) EP-A-1 450 432

2. Novelty

From citation (1) a *method for prevention of moisture generated in a fuel cell* is known freezing by *evacuating the fuel cells using dry gas or low humidity*. The blow off of the condensed water by *increasing the flow rate of supply gas* is known from (2). A further method *periodically reversing the flow direction* of the oxidant gas stream through the fuel cell is suggested in (3) and (4). Citation (5) discloses a water management for fuel cells comprising an opening or vent with *hydrophobic portions on critical surfaces* urging liquid water to migrate away. This approach is referred to in (6) which also de-scribes a *concentration gradient across the membrane to the anode* in order to remove liquid water. To reduce flooding caused by condensed water a *switching means* is suggested in (7) so that inlets and outlets of the switchable are maintained in both operational modes. Since none of the cited prior art (1) - (7) documents discloses arranging the *moisture adsorption capacity* of the end cells to be larger than that of the center cells, it appears that the requirements of **Article 33 (2) PCT** are met for the claimed fuel cell system.

3. Inventive step

For the assessment of **inventive step** (**Article 33 (3) PCT**) of the claimed subject-matter, a document has to be identified which represents the **respective closest prior art** and starting from that document the technical problem has to be addressed.

3.1 Taking into account the above analysis of the cited prior art, all the cited prior art documents refer to methods of preventing / reducing flooding of fuel cell (stacks).

Citation (1) or possibly (2) are considered to represent the closest prior art. In (1) - (6) all the technical features of present claim 1 are described (fuel cell stack comprising a plurality of fuel cells stacked in series) except the "larger moisture absorption capacity of the second cell disposed in a position other than the center position". Starting from the respective closest prior art, the first **technical problem** underlying the application in suit (**Rule 5.1 (a) (iii) PCT**) can be considered to be the provision of further fuel cell system comprising a water management system for preventing/reducing flooding in particular during starting up (see p.2, last par.).

3.2 For the purpose of solving this problem the skilled person would regard the subject-matter of claim 1 to be suitable for this purpose, since from a "larger moisture absorption capacity of the second cell disposed in a position other than the center position" prevention of flooding of a fuel cell in general can be expected. As stated in the description the *moisture absorption capacity* is increased by a larger thickness of the membranes. Since the thickness of the membranes is not specified in the cited prior art (compare e.g. in (5) the coating as hydrophobic surface), the notional skilled person was provided with a clear **hint** from common general knowledge pointing him in the direction of the claimed fuel cell system. It was only necessary to confirm experimentally that the highly probable result was in fact obtained. The necessity of experimental confirming a reasonably expected result does not render an invention unobvious. The features described above are merely ones of several possibilities from which the skilled person would select, in accordance with circumstances, without the exercise of inventive skill in order to solve the problem posed. The skilled man having knowledge of the teaching of documents (1) - (6) with a **reasonable expectation of success** would expect the fuel cell system with a larger moisture absorption capacity of the second cell disposed in a position other than the center position of claim 1 to reduce/prevent flooding i.e. to be useful for the above purpose. No positive contribution to inventive step can be seen in solving the particular problem of providing a further fuel cell system with a larger moisture absorption capacity of the second cell disposed in a position other than the center position, because the skilled

man, who was faced with this problem would expect the claimed fuel cell system to be suitable for his purpose i.e. without the exercise of inventive skill in order to solve the problem posed. The Applicant's attention is furthermore drawn to the fact that the Examining Division must satisfy itself that the problem is solved. Moreover, it is common practice that the modifying feature should not only characterize the invention in the claim, i.e. distinguish it from the prior art, but must contribute **causally** to the improvement of the capability thereby achieved.

3.3 Given the claimed fuel cell system to solve the above defined problem, **inventive step** could only be recognized if the Applicant could demonstrate that the presently claimed fuel cell system illustrates actually surprising effects in comparison with the closest prior art. Only if the solution of the problem underlying the present application is the provision of composites which have **unforeseeable** advantages over the prior art, an **inventive step** in the sense of **Article 33 (3) PCT** could be recognized.

3.4 Finally, it is realized that the Applicant is entitled to claim all obvious modifications of what he has described and that alternative variations have to be supported by a certain number of examples. Furthermore, the extent of a "reasonable generalisation" only depends upon the question of the relative distance to the prior art. It is stressed that only such variants of the fuel cell systems can be claimed which are a solution to the above stated problem i.e. which illustrate the alleged unexpected effects.

3.5 Any information the Applicant may wish to submit concerning the subject-matter of the invention, for example further details of its advantages or of the problem it solves, and for which there is no basis in the application as filed, should be confined to the letter of reply and not be incorporated into the application (**Articles 34 (2) (b) and 19 (2) PCT**).

3.6 The Applicant is requested to file amendments by way of replacement pages in the manner stipulated by **Rule 66.8 (a) PCT**. In particular, fair copies of the amendments should be filed preferably in triplicate. Moreover, the Applicant's attention is drawn to the fact that, as a consequence of **Rule 66.8 (a) PCT** the examiner is not permitted to carry out any amendments under the PCT procedure, however minor these may be.

4. Industrial applicability

No objection re industrial applicability of claims 1 - 33 arises insofar the claimed fuel cell system would illustrate unexpected effects (**Article 33 (4) PCT**).

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING
AUTHORITY (SEPARATE SHEET)**

International application No.

PCT/JP2004/006679